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THE EFFECT OF VARIOUS SLASH DISPOSAL METHODS ON THE REGENERATION OF CUT-OVER JACK PINE STANDS

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by
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The Effect of Various Slash Disposal Methods on the Regeneration of Cut-Over Jack Pine Stands

Project M.S. 143

by

H. J. Johnson*

INTRODUCTION

The problem of securing adequate jack pine (*Pinus Banksiana* Lamb.) regeneration on cut-over areas, and at the same time minimizing the fire hazard from slash, is a vital one. Several methods of slash disposal have been used in the past; among the commonest are piling, piling-and-burning, swamper or progressive burning, and lopping-and-scattering. Some disagreement exists as to the merits of each particular method with respect to fire hazard and the subsequent regeneration of cut-over areas.

In 1949-50, an investigation was initiated in southeastern Manitoba to relate the fire hazard existing in cut-over jack pine stands to the year of logging and the method of slash disposal. At the same time a relationship was sought between the two factors and the amount of regeneration. Williams (1) has reported on the fire hazard, and this report presents the findings on regeneration.

LOCATION AND DESCRIPTION OF THE AREAS

The surveys were conducted in the Piney and Hadashville districts, approximately 40 miles apart, in the Sandilands Forest Reserve in southeastern Manitoba.

In both localities the topography is flat with an occasional gentle slope. The soil is sand or sandy loam. The stands which were clear cut were understocked and composed of open-grown jack pine. The vegetation on the areas is characterized by grasses and low shrubs. In addition to the grasses, the following species were usually present in varying quantities: *Prunus* spp., *Salix* spp., and *Rosa* spp., *Vaccinium* spp., *Arctostaphylos uva-ursi*, *Gaultheria procumbens*, *Galium boreale*, *Maianthemum canadense*, *Cornus canadensis*, and *Cladonia* spp.

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SLASH DISPOSAL METHODS

Cut-over areas where six different methods of slash disposal had been practised were examined. The disposal methods are as follows:

1. Left as cut—
   After felling, trees were limbed. Branches and tops were left where they fell.
2. Piled and unburned—
   Piles were about 6 feet high, roughly circular, and spacing varied according to slash volume.
3. Piled and burned—
   Slash was piled as in (2) and thoroughly burned.
4. Tops only left—
   After felling, tops were lopped off and left. Very little of the slash was from limbing the trees. Usually only the clear length of the tree was utilized.
5. Lopped and scattered—
   Slash was lopped from the trees and scattered so as to be not more than one and one-half feet deep at any point.
6. Piled in windrows—
   Slash was piled in long parallel rows, approximately one chain apart.

For each disposal method, four age classes of slash were to be investigated, i.e. 1-2, 3-5, 6-9, and 10-12 years, thus requiring a minimum of 24 study areas to sample all conditions without replication. Wherever possible, replicate areas were sampled.

Unfortunately, most age classes of the lopped-and-scattered method of slash disposal were not found in 1949 near Piney and it was necessary to supplement the data the following year with samples from the Hadashville district, approximately 40 miles to the north of Piney. In view of the considerable distance between the areas and the possibility of site differences, a complete set of piled-and-burned areas was also studied in 1950 to check comparability.

The cutting methods ranged from medium selection to clear cutting. On most areas there were few residual trees left. Since all stands before logging were open-grown, trees were very branchy so that there was considerable slash on each cut-over area.

METHOD OF SURVEY

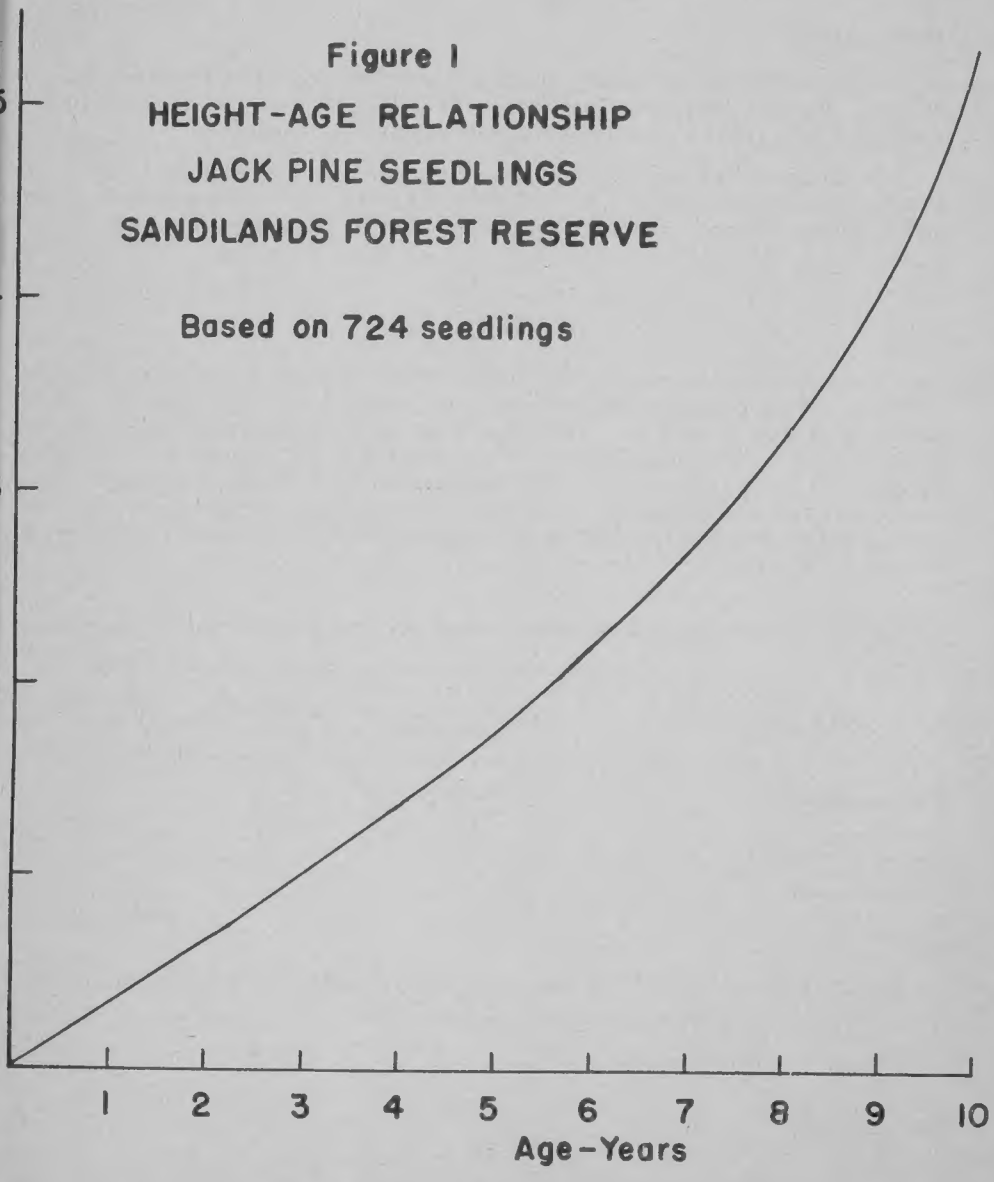
The method of survey in 1949 differed from that in 1950. Both are described under separate headings.

1949 Survey

Cut-over areas were sampled systematically with milacre single examination quadrats established every two chains along lines which were also two chains apart. The direction of the lines and their position on the cut-over area were determined prior to the field work in order to eliminate personal bias in sampling.

The steel chain acted as one border of the plot and three poles, 6·6 feet long, were used to delineate the other three. In all cases, plots were established along the same side of the line.

All seedlings on the plots were tallied by species, height, and age. The latter was determined by whorl counts which were checked periodically by cutting seedlings at their base. The age of jack pine is often difficult to estimate because of its habit of sometimes forming more than one whorl a year. However, a height-age curve (Figure 1) was prepared for seedlings on these areas and it was found that the age to reach breast-height as read from the curve compared favourably with that determined by actual ring counts on trees in the same vicinity.



At every ten chains on the line, general notes were made on the following

1. Topography
2. Vegetation
3. Soil
4. Residual stand
5. Advance growth
6. Type of slash disposal
7. Age of cut
8. Type of operation

1950 Survey

Surveys were made chiefly on areas where the lopped-and-scattered method of slash disposal had been practised. In addition, some areas on which the slash had been piled and burned were surveyed as a check.

As the areas did not exceed two to three acres in size, each one was sampled by one or more temporary plots, 100 by 100 feet. All seedlings were counted on the plots. Descriptive data were collected as in the previous year.

RESULTS

Data were combined to determine whether or not a correlation existed between average number of seedlings and method of slash disposal. This is shown in Tables I and II. The data were further analyzed and averaged to show a relationship between number of seedlings and number of years since logging. (Tables III and IV) The distribution or percentage of quadrats with one or more seedlings and the total number of seedlings per acre are also shown for the 1949 survey. The method of sampling precludes showing the distribution for the 1950 survey.

TABLE I—RESULTS OF THE 1949 SURVEY—BY METHOD OF SLASH DISPOSAL

Slash Disposal Method	No. of Plots (1/1000 acre)	No. of Seedlings per Acre	Per Cent of Plots with 1 or More Seedlings
Piled and unburned	35	972	37
Left as cut	31	574	28
Piled in windrows	25	360	16
Lopped and scattered	22	318	9
Tops only left	40	243	11
Piled and burned	53	170	9

TABLE II—RESULTS OF THE 1950 SURVEY—BY METHOD OF SLASH DISPOSAL

Slash Disposal Method	No. of Plots (0·23 acre)	No. of Seedlings per Acre
Lopped and scattered	6	242
Piled and burned	8	152

TABLE III—RESULTS OF THE 1949 SURVEY—BY AGE CLASS OF SLASH

Age of Slash (years)	No. of Plots (1/1000 acre)	No. of Seedlings per Acre	Per Cent of Plots with 1 or More Seedlings
1 - 2	74	191	9
3 - 5	59	701	18
6 - 9	36	622	17
10 - 12	37	370	37

TABLE IV—RESULTS OF THE 1950 SURVEY—BY AGE CLASS OF SLASH

Age of Slash (years)	No. of Plots (0·23 acre)	No. of Seedlings per Acre
1 - 2	2	113
3 - 5	4	638
6 - 9	4	475
10 - 12	4	270

It will be noted from Table I that in general the number of seedlings and their distribution appear related; the greater the number of seedlings per acre, the higher the percentage of stocked quadrats.

A comparison of Tables I and II shows that the numbers of seedlings per acre on lopped-and-scattered areas are, in approximately the same proportion, greater than on piled-and-burned areas. This would suggest that conditions are similar on the areas studied in 1949 and 1950 although they are some distance apart.

It was anticipated that a relationship would be found between the age of the slash and the total number of seedlings per acre. The greatest number of seedlings per acre was found on areas where the slash was three to five years old, followed by areas on which the slash was six to nine, ten to twelve, and one to two years of age in that order of magnitude, i.e. 3-5 > 6-9 > 10-12 > 1-2. Tables III and IV show that the same trend is evident for areas studied in 1949 as for areas studied in 1950.

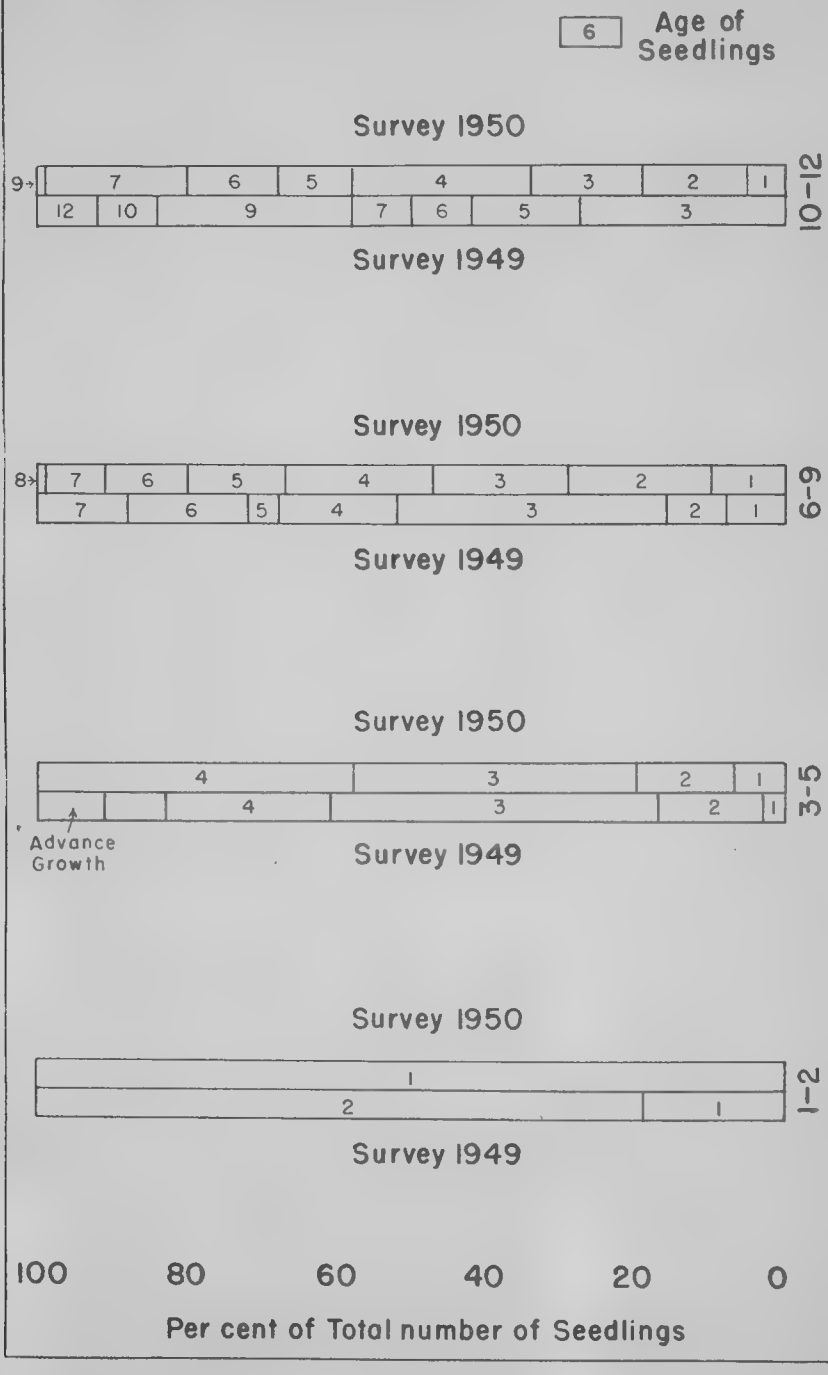
The reasons for this trend are not clear. It is possible that on the areas which are covered with slash 1-2 years of age, all of the available seed may not have germinated at the time the areas were examined. To this might be attributed the comparatively few seedlings on areas where the slash is most recent.

An inspection of Figure 2 eliminates the possibility that on some of the areas the total stocking is largely advance growth. The figure shows the percentage of the total number of seedlings of each age tallied on areas where the slash was of various ages. In only one instance were seedlings found that were older than the age of the cut. These were few in number and were found in areas where the slash was three to five years old.

On the basis of distribution, which is probably a better index of stocking than number of trees per unit area, the piled slash disposal method was more conducive to reproduction than any other method here studied. Piled-and-

Figure 2

DISTRIBUTION OF SEEDLINGS BY AGE



burned and tops-only-left were the least conducive methods, and left-as-cut and windrows were intermediate. As only the youngest age class of the lopped-and-scattered method was sampled, its position with respect to the other methods is uncertain on the basis of percentage stocking.

Results of a study by Eyre (2) in the Lake States indicated that on all t-over jack pine areas studied, regardless of the method of slash disposal, generation was not satisfactory. Results from this study suggest a similar nclusion. Based on the number of quadrats with one or more seedlings, e highest stocking, which is on piled-and-not-burned areas, is only 37 per cent full stocking. This may be regarded as barely adequate.

In Michigan, experiments with seed traps set under jack pine show that re than enough seed is released to restock cut-over areas. What then is the son for the inadequate regeneration of cut-over jack pine stands? Eyre ggests that the young seedlings cannot survive under dense accumulations slash. This would probably apply to areas where the slash is piled or wind-ved. Lopping-and-scattering, however, should not result in this condition, d yet the regeneration of these areas in the Sandilands Reserve was less than areas where other methods of disposal were employed.

Except where the slash is piled-and-burned, thereby destroying the seed pply, the method of slash disposal does not appear to be the limiting factor securing adequate regeneration. The condition of the seed bed and supply available moisture probably play an equal or more important role. Therefore, less some ground preparation is anticipated, it is difficult to recommend y method of slash disposal which will positively influence the satisfactory generation of logged jack pine stands. Experiments, initiated in 1951 on the ding Mountain, indicate that scarification after the logging of jack pine nds is favourable. On the other hand, a similar experiment, conducted in e Sandilands Forest Reserve in 1952, has shown that there is little or no generation on scarified cut-over areas after two years. In the latter experiment, wever, it was thought that climatic conditions might have been responsible the death of germinates during a drought period in August of 1952.

Williams (1) found that all methods of slash disposal studied on the Sand-nds Reserve, with the exception of piling-and-burning, constituted high fire zards. Piling-and-burning, as would be expected, effectively reduced the fire zard and this method was recommended strictly from the fire protection andpoint.

Since no method of slash disposal resulted in satisfactory regeneration, policy of piling-and-burning, followed by planting or seeding, might be the ost suitable method of handling similar areas.

CONCLUSIONS

All methods of slash disposal studied in the Sandilands Forest Reserve sulted in unsatisfactory regeneration. Piling was the only method used from hich anything approaching acceptable stocking resulted. This method, owever, creates a high fire hazard. It is clearly indicated that the method slash disposal is not the only factor influencing the regeneration of jack ne cut-over areas. Where regeneration is desired, some method of ground reparation or artificial regeneration in conjunction with the least hazardous nethod of slash disposal may be most feasible.

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Affa... Div., Tech. Note No.

2. Eyre, F. ... d slash. Reprinted
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